The Effects of Exchange Rates Volatility on the growth of Gross Domestic Product in Nigeria

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ABSTRACT

The study is an empirical investigation of the effects of real exchange rates volatility on the growth of gross domestic product in Nigeria. Annual data was employed covering the period 1960-2012, on the relevant variables such as real exchange rates, gross domestic product, inflation, import and export. A review of the literature reveals that foreign exchange rates movements can either have a positive or a negative effect on the gross domestic product.

The empirical analysis began with testing for stationarity of the variables (Unit root test) by using the Augmented Dickey-Fuller (ADF) test procedure and the Phillips Perron test, after the stationary of the variables was established, it was followed by the cointegration estimation, vector error correction and the Granger-Causality test.

The result of the estimation suggested that to maintain a positive growth in real GDP, the domestic currency must depreciate in value. The estimation also indicated a positive relationship between export and real GDP, while a negative relation between real GDP and import.

Keywords: Foreign exchange, Gross Domestic Product, Co-integration, Vector Error Correction mode

ÖZ

Çalışma Nijerya'da gayri safi yurtiçi hasılabüyüme reel döviz kuru dalgalanmaetkilerinin ampirik bir araştırmadır . Yıllık veriler, reel döviz kurları , gayri safi yurtiçi hasıla , enflasyon , ithalat ve ihracat gibiilgili değişkenler üzerinde ,1960-2012 dönemini kapsayan istihdam edildi .

Literatür incelemesi döviz kurları hareketleri olumlu veyagayri safi yurtiçi hasıla üzerinde olumsuz bir etkisi olabilir ya da ortaya koymaktadır.

Ampirik analizAugmented Dickey - Fuller (ADF) test prosedürü vePhillips Perron testi iledeğişkenler (Birim kök testi) durağanlık için test ile başlayandeğişkenlerinsabit kurulduktan sonra , bubütünleşme tahmin izledi , vektör hata düzeltme veGranger - Nedensellik testi.

Kestirimsonucu reel GSYİH olumlu bir büyüme sağlamak için ,yerli para değer kaybına uğrar gerektiğini önerdi . Tahmin ayrıca ihracat ve reel GSYİH arasında pozitif bir ilişki belirlenmiştir , reel GSYİH ve ithalat arasında negatif bir ilişki ise .

Anahtar kelimeler: Döviz , Gayri Safi Yurtiçi Hasıla , Co - entegrasyon , Vektör Hata Düzeltme modu

To the queen of my heart and the driving force in my life; Hajia Nana-Hauwa and my late dad, His Royal Highness; Alhaji Mohammed-Sanni (May Allah showers his Light and Mercy on your grave)

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
BOP	Balance of Payments
CBN	Central Bank of Nigeria
CD	Cobb-Douglas
CPI	Consumer Price Index
DAS	Dutch Auction System
ECM	Error Correction Mechanism
EMU	European Monetary Union
ESCB	European System of Central Bank
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
IFEM	Inter-bank Foreign Exchange Market
IMF	International Monetary Fund
LN	Natural Logarithms
OCA	Optimal Currency Area
PP	Phillips Perron
PPP	Purchasing Power Parity
RER	Real Exchange Rates
SAP	Structural Adjustment Programme
TOT	Terms of Trade
VEC	Vector Error Correction
VECM	Vector Error Correction
VAR	Vector Autoregressive

Chapter 1

INTRODUCTION

1.1 The Background of the Study

Research on exchange rate management continues to be of great interest to economists. The reason being that, exchange rate is a key variable in the general economic policy formation of a country, as its depreciation or appreciation affects the performance of major macroeconomic variables. An exchange rate movement has been acknowledged as one of the endogenous factors, which affect the performance of an economy. According to Cottani et al. (1990), the poor economic performance of Asia, Africa and Latin America over the years can be attributed to real exchange rate behavior. The exchange rate is not only an important relative price that allows the interactions of local and international market; it is also as an indication of the strength of the currency of a country as compared to the rest of the world. It can therefore be said that a good exchange rate framework is an important determinant of a sound economic growth.

The revenue from the agricultural sector was said to account for over 70 percent of the GDP in Nigeria from the 1960s and up to the early 1970s. However, due to the oil-boom in the 1970s the revenue from the agricultural sector declined significantly as crude oil became the mainstay of the Nigerian economy. In the 1980s, Nigeria was faced with huge capital inflows from the sales of crude oil that resulted in the appreciation of the Naira. However, in 1981, the world crude-oil market experience

deterioration in crude oil price which led to serious economic crises in Nigeria. Hence as observed by Adubi and Okumadewa (1999), the oil boom in Nigeria ended in 1983, leaving behind a massive currency appreciation that hindered or slows down the economic performance of the country's national economy especially in the agricultural sector. In the late 1970s and the 1980s, the Naira was said to be overvalued and such over-valuation was causing obvious adverse effects on the general economic performance, therefore an urgent need to restructure the exchange rate market in order to mitigate these effects.

Nigeria has a large market due to its population, which is over 160 million as at 2012. Aside its exports of crude oil, most of the goods and services that are commonly used in Nigeria are imported. The discovery of oil in Nigeria has led to a mono-economic system. Nigeria relies on importation for basic goods and services; the importation of goods is enabled by exchange rates. Due to high importation, it is obvious that demand for foreign currency as against the naira will be greater than supply. This will cause the naira to depreciate against other currencies; such depreciation affects the macro-economic equilibrium, which can results in the under-performance of other important economic variables. This study looks at the effects of foreign exchange rates volatility on the gross domestic product in Nigeria.

Foreign exchange rate is the price of a country's currency in relative terms to that of another country and it thus plays a significant role in international trade relations and international finance. It is also a foundation, which encourages sustainable macroeconomic balances both internal and external over a period. Therefore, it is not an easy task to answer the question as to what determines the equilibrium exchange

rate and its effects on other vital macroeconomic variables. As stated by Williamson (1994), the level of misalignment of the foreign exchange rate as well as the estimation of the equilibrium exchange rates continues to be of great challenge for sound and potent macroeconomic policies for an open economy.

The fundamental problem is that, the equilibrium exchange rate cannot be predicted and it is unobservable. While the foreign exchange rate disequilibrium is a condition where the exchange rate of a country moves from the equilibrium rate, an exchange rate is considered "overvalued" when it appreciates beyond the equilibrium and "undervalued where it depreciates beyond the equilibrium.

Obadan (1994) indicated that there is a general acceptance by scholars that protracted and significant exchange rate disequilibrium can lead to harsh macroeconomic problems for sound macroeconomic management policies with regards to a country's external balance position. In the light of the above, the rectification of the external balance will entail both sound macroeconomic policies and hence, the devaluation of the exchange rate.

Policies on exchange rate in emerging nations are very sensitive and highly controversial, largely due to the type of structural change, which involves decreasing import or increasing export, this indirectly means a depreciation of the nominal exchange rate. The management of foreign exchange rate has in the last four decades experienced significant modifications in Nigeria. One of the remarkable events was the devaluation of the local currency with the implementation of the Structural Adjustment Programme in 1986.

The determination of a suitable and sustainable exchange rate policy has not been an easy task in Nigeria. Prior to the implementation of the Structural Adjustment Programme in 1986, the National currency (naira) was said to be overvalued and that was the reason why it was opened to market forces to determine its realistic value that would diversify and improve the performance of the Nigerian economy. The central aim was to streamline the production base of the country to increase the agricultural sector for export. The reform of the foreign exchange, which aided the successive depreciation of the exchange rate, was projected to make the agricultural product cheaper in the international market, such that there will be an increased demand to boost domestic production. However, the consequences of the depreciation lead to changes in the volume and structure of Nigeria's export. Various scholars have studied this empirically notably Oyejide, (1986) and Osuntogun et al. (1993). Such internal adjustment, owing to its short run effect on prices and demand, are believed to be highly detrimental to the structure of the economy. However, the huge distortions associated with overvalued exchange rate system are barely an issue of discussion in emerging countries, which relies highly on imports for both consumption and production.

1.2 The Patterns of Foreign Exchange Rates Policy in Nigeria

In the last four decades, the management of foreign exchange rate has experience significant modifications in Nigeria. One of the remarkable events was the devaluation of the currency in 1986 through the introduction of the Structural Adjustment Programme. The determination of suitable and sustainable exchange rate policy in Nigeria has not been an easy task. Prior to the introduction of the Structural Adjustment Programme, the national currency (naira) was said to be overvalued and that was the reason why it was opened to market forces to determine its realistic

value that would improve the performance of the economy and diversify the Nigerian production base. The central aim was to streamline the production base with the focus of increasing the agricultural sector for export. Adubi and Okundawa (ibid), highlighted that the reform of the exchange rate that aided the successive devaluation of the Nigerian currency was targeted at decreasing the international prices of the output from agriculture for export thereby boosting the domestic production. However, Osuntogun et al. (ibid) pointed out that the devaluation changes the volume and structure of export in Nigeria, as has been empirically studied by many scholars.

The flexible exchange rates policy was introduced to allow the forces of demand and supply to determine the equilibrium price at any given time. However, the volatility that accompanied flexible exchange rate regime does not allow the full potential of domestic and international investors to be fully utilized. Up to this time, after the devaluation of the currency, the Naira has not been able to find it appropriate value. So far in Nigeria the foreign exchange rate policies have not been effective in achieving the desired objectives. Nigeria continue to depend on oil as the source of its foreign currency earnings while output from agriculture that use to be the mainstay of the economy before the discovery of oil, has continued to dwindle. This has made it important to undergo a research on how exchange rate affects the GDP.

The goal of the exchange rate reforms is to identify a suitable exchange rate policy and ensure the sustenance of such reform. Over the years, a lot of effort has been put in place to accomplish this goal through the application of different kind of foreign exchange rate policy in order to achieve efficiency. Exchange rate management in Nigeria was transformed from the fixed system that was in place in the 1960s to the

"pegged" system in the 1970s as well as the mid 1980s and lastly, to the several variants of the flexible exchange rate system through the introduction of the Structural Adjustment Programme.

Nigeria implemented the International Monetary Fund and the World Bank imposed Structural Adjustment Programme in 1986. The approach of the Structural Adjustment Programme emphasizes a market driven system for the determination of foreign exchange rates. The position of the balance of payments and the poor level of the external reserves informed this choice. Thus according to Obadan (1994), the nominal and the real exchange rates were depreciated in order to align them to their appropriate equilibrium rates. This lead to gains in the Nigerian economy such as enhanced agricultural production via increase in tariffs on agricultural imports and subsidy on some agricultural inputs like fertilizer, which resulted in the reversal of the former situation where there was a trade protection of all export of crops in the country (Hino, 2003).

In line with Nigeria's Structural Adjustment Programme, a second-tier foreign exchange market was introduced in 1986. The main goal of the second-tier foreign exchange was to achieve an appropriate exchange rate through a sequence of the exchange rate depreciations. The dual exchange rate policy was implemented through the Second-tier Foreign Exchange Market (SFEM) and both rates were merged together in 1987 at 1 USD to 3.74 naira.

In 1987, the Dutch-Auction System was introduced to develop the bidding system. In that same year, Second-tier Foreign Exchange Market (SFEM) and the Dutch Auction System (DAS) were further replaced with the introduction of the Foreign

Exchange Market (FEM). As stated by Odubogun (1995), the purpose was to reduce the multiplicity of foreign exchange rates and guarantee the depreciation of the naira. The Inter-bank Foreign Exchange Market (IFEM) and Bureau de change were both introduced in 1989 to take care of the needs of small end users. Thus, the Interbank Foreign Exchange Market was modified in 1990 to give room to the reintroduction of the Dutch Auction System.

Nigeria in 1993 deregulated the exchange rates market and it was further improved through the realignment of the parallel market and the official exchange rate. In 1994, the Inter-bank Foreign Exchange Market was replaced with the Autonomous Foreign Exchange Market. The aim of this replacement was to guarantee the sale of foreign exchange currencies at the market driven price through the authorized marketers. The domestic currency was further devalued such that in the autonomous market, 1 United States dollar was equivalent to 92 naira in 1999. This resulted in a wide gap between the official exchange rate and the parallel market. The subsequent depreciation of the currency in 1998 facilitated a market-driven arrangement that led to the reduction in the premiums that is observed in the parallel market, which narrowed the difference between the parallel market and the official exchange rates. In a bid to enhance the activities of the inter-bank foreign exchange market, the inter-bank Foreign Exchange Market was re-introduced in 1999.

As described in the CBN bulletin (2010), the Nigerian currency continues to depreciate and as at 2002, 1 United States dollar was equivalent to 120 naira. This period was also marked with high revenues from the sale of crude oil as well as

improvement in the performance of the economy owing to the reforms in the banking sector.

Aliyu (2007) highlighted that in 2005 due to the monetary and fiscal policy, as well as the high inflows of revenue made the Naira to gain value considerably. To effectively manage the pressures on exchange rate, the Central Bank reintroduced the Dutch Auction System. The Nigerian currency however continued to gain value due to rising revenues from the sale of crude oil. One important factor that leads to the misalignment of the naira is that on one hand, the naira appreciates tremendously due to the high earnings from the sales of crude oil and on the other hand, it depreciates and fluctuates frequently due to the high importation of goods and services. However, this twofold of events does not appear to balance-up both in the short run and the long run. A policy to control and stem the effect of naira appreciation and depreciation must be implemented.

Mordi (2006), indicated that the circumstances that necessitated the re-introduction of the Dutch Auction System in 2002, was the stand of the external reserve, which was capable of ensuring sufficient funding of the foreign exchange market by the Central Bank to instrument it's autonomy, bring down the inflationary pressures, as well as to allow the deployment of monetary management instruments that would sustain the Dutch Auction System. This was meant to ensure a constant and steady supply of foreign currency. The Dutch Auction System was to serve three main purposes i.e. reducing the premium of the parallel market, protect the decreasing the external reserves and achieve an appropriate exchange rate of the naira. The Dutch Auctions System has facilitated the stabilization of the fluctuations in the naira

exchange rate, by reducing the rising premium, minimize the speculative tendencies of the authorized dealers and conserve the external reserves. This has in general led to the stability of the foreign exchange market since 2003.

The International Monetary Fund (IMF) research of 1984, argued that variability of the exchange rates stimulates undesirable macroeconomic problems such as inflation and balance of payment imbalances. For example, where exchange rate variability leads to high importation of goods and services, such policies that discourage import would be highly ineffective. There have been various policies by the Nigerian government on how best to effectively manage the foreign exchange market and many studies have been undertaken by scholars on foreign exchange volatility and its impacts on trade relations in Nigeria. Despite all the policies and studies, the issue of foreign exchange movements remains a big problem in Nigeria. Could this be a result of inappropriate policies or gaps in the studies so far conducted? It is against this backdrop that the research seeks to investigate further the effect of exchange rate movements on Gross Domestic Product (GDP).

1.3 Significance of the study

If the source of the volatility in foreign exchange rate can be identified and corrected, it will enhance trade relations, which can bring about economic growth and development in Nigeria. Foreign exchange rates is affected by major macroeconomic variables such as real interest rate, inflation, imports and exports, BOP, gross domestic product etc, which are used to gauge the strength of an economy. The study is intended to identify how the fluctuations in the foreign exchange influence these macroeconomic variables and how they all affect GDP in

both the short run and in the long run. This study will also serve as a tool and guide towards policy formation and implementation on foreign exchange rate in Nigeria.

1.4 Statement of the Problem

The revenue from agriculture accounted for over 75 percent of the gross domestic product in Nigeria from the 1960s and up to the early 1970s. However, because of the oil-boom in the 1970s the revenue from the agricultural sector declined significantly as crude oil became the mainstay of the Nigerian economy. In 1981, the world oil market experienced deterioration in the prices of crude-oil which led to serious economic crises in Nigeria. Nigeria has a large market due to its population, which is over 160 million as at 2012. Aside, its exports of crude oil, most of the primary goods and services that are commonly used in Nigeria are imported. The discovery of oil in Nigeria has lead to a mono-economic system. Nigeria relies on importation for basic goods and services; the importation of goods is enabled through exchange rates. Due to high importation, it is obvious that demand for foreign currency as against the naira will be greater than supply; this will cause the naira to depreciate against other currencies. This research would critically study the effects of foreign exchange rates on the growth of gross domestic product in Nigeria.

1.5 Research Hypothesis

The research question will include but not limited to:

- What are the short and long-term impacts of exchange rate movements on GDP in the Nigerian economy?
- Is there a significant relationship between the volatility of exchange rates and macroeconomic variables such as inflation, import, export and GDP? and
- What is the causal relationship between macroeconomic variables and GDP?

The research questions will be considered through research objectives stated below.

1.6 Objectives of the Study

The central objective of the research is to analyze the impact of foreign exchange rate and some macroeconomic variables on the Nigerian economy, based on annual data from 1960 to 2012. The specific objectives will include but not limited to:

a) examine the short and long-term impacts of exchange rate volatility on GDP in Nigeria;

b) ascertain the relationship between macroeconomic variables such as the exchange rate, inflation, import, export, and GDP; and

c) determine the causal relationship between the macroeconomic variables and GDP.

Base on results obtained from the analysis policy proposal will be suggested, for the optimal management and control of Nigeria's exchange rate, inflation, export and import demand.

Chapter2

LITERATURE REVIEW

2.1Theoretical Review

The Purchasing Power Parity Theory

Abdullah (2008) and Allsopp and Zurbruegg, (2003) emphasized that the concept of Purchasing Power Parity is built on the law of unity price, which implies that in the absence of transportation and transaction costs, the prices of identical goods across the world is equal if expressed in same currency.

Ugbebor and Olubusoye (2002) offered two variants of Purchasing Power Parity (PPP) relative and absolute form, but most analysis in the literature regarding exchange rate determination across countries whether the restrictive or absolute form have produced differing opinions and results. However, Allsopp and Zurbruegg, (2003) noted that PPP serves three main purposes: it serves as an indicator of impending currency crises; it serves for the function of monetary union or currency pegs; and it measures income inequality.

$RER = e.P^F/P = constant$

When Purchasing Power Parity holds, real exchange rate is equal to a constant, such that changes in the real exchange rate correspond with the change in PPP. However, empirical studies confirmed that the PPP is a poor depiction of exchange rate behavior especially in the short run, where there is high volatility in exchange rates

and the local prices are somewhat sticky but in the long-run, PPP seems to offer a reasonable good guide.

As observed by Rogoff (1996) many contemporary economists do not accept that the Purchasing Power Parity holds in the real world, a lot intuitively think that some variant of PPP serves as a security for long-run real exchange rate. Undoubtedly, the postulation of most analysis in macroeconomics is; some form of PPP is valid in the long run relationship. The purchasing power parity is a long-term approach used for the purpose of determining the equilibrium exchange rate. In Central Bank of Nigeria CBN (1998) it was stated that PPP mostly used as an alternative for the monetary model in exchange rate analysis.

The Optimal Currency Area Theory

One other leading theory on issues of exchange rate is the Optimal Currency Area theory (OCA), which was developed by Mundell (1961) and McKinnon (1963). OCA is a theory based on geographical location in which countries optimizes economic efficiency when an entire geographical region shares a single currency, such as, international risk sharing among the countries. Mundell has modeled how exchange rate uncertainty will interfere with the economy either positively or negatively. The OCA theory postulates that fixed exchange rate system is capable of enhancing trade interactions and increase productivity performance by stemming the uncertainty associated with flexible exchange rate system the cost of hedging and encouraging investment through the reduction in premium in lending.

A currency area adopts an irrevocable fixed exchange rate system or a single currency within its region and maintains a flexible exchange rates system with the

rest of the world. A typical example of OCA is the European Monetary Union (EMU), which is the outcome of Mundell's theoretical approach. On January 1st, 1991 eleven member states of the EU adopted a single currency and in 2001 Greece joined the EMU. This has led to a currency area of over 300 million consumers. The choice to adopt a common currency comes with a greater sacrifice of sovereignty over their monetary policies that a fixed exchange rate regime usually requires. They in essence accepted to give up their currencies entirely and to hand over the regulation of their monetary policies to a collective European System of Central Bank (ESCB) Krugman and Obstfeld (2009).

According to Dada and Oyeranti (2012), the OCA theory is centered on the stabilization of the business cycle and increasing trade interaction in the region. This is based on the idea of balancing the shocks, fiscal adjustment, the level of openness and the mobility of factors. The main benefit of this kind of fixed exchange rate system is that it simplifies transactions and allows a more predictable basis for decision than the flexible system. Members in the currency area involve cost as well as benefits, the cost arises because when a country joins the currency area it indirectly give-up it power to utilize the monetary policy and exchange rate for the stabilization of production and employment.

One of the setbacks of the OCA is that it has the capacity to strip member states of their ability to carry out an independent domestic monetary policy and this has led to serious economic problems in most European countries. The OCA model is less cited as it has the capacity to cut-down trade interaction and income by slowing or even halting the required price adjustment process, which often lead to speculative attacks.

The Dutch-Disease Phenomenon

Countries that are highly endowed with natural resources rely heavily on the natural resources for exports and foreign currency earnings. The Dutch-Disease theory presupposes that a rise in the prices of the exported commodity in the global market increases the incentive to invest more in that sector, which leads to output growth in the sector, when there is an increase in overall output it increases the wage level. If there is an increase in wages in one sector, it raises the tendency of an increase of wages in other sectors because there is the need for wages to equalize across board. This will lead to a reduction in the general performance of the economy, thereby reducing the competitiveness of the sector of the natural resources. Most nations that are rich in crude oil have this problem. Thus according to Auty (2001), the Dutch disease in oil-exporting countries results in a decrease of non-oil tradable output due to increased income coming from the sale of crude oil.

Similarly, due to increase in the wage level, the prices of non-tradable goods will increase. According to Acosta (2007) the relative prices of commodities will rise and a continuous rise in price will result in the appreciation of the real exchange rate induced by the high inflow of export earnings. Hence, the implication of the Dutch-Disease theory is the appreciation of the real exchange rate.

The original model was developed by Neary and Colden and it was based on the assumption that the economy of a small open country includes the tradable which is the manufacturing and the energy sectors and the non tradable goods which is the service sector. The determination of the prices of tradable commodities follows the

world market price while that of the service sector depends on the domestic market price. As observed by Fielding (2010), the boom in the manufacturing and the energy sector result in huge inflow of capital and this will make the local currency to gain value. This appreciation will raise the prices of the locally manufactured goods and the effect is a reduction in the demands for tradable goods in both the local and the international market. This follows the simple law of demand and supply.

When the domestic exchange rate appreciates, it means that goods manufactured locally cost higher in the world market compared to similar goods manufactured in other countries. It has also been found that, the appreciation of the local currency reduces a country's competitiveness in the world market. When the competitiveness of a country is reduced in the international market, it hurts mainly the manufacturing sector. Due to the high prices of the manufactured goods, consumers would rather buy the cheaper goods to minimize cost. The reduction in the demand for good in the manufacturing sector will lead to a fall in the sector. The manufacturing industries in reaction to the reduced demands of their output decreases production through massive layoff of workers, thereby causing unemployment in the country.

The reduction in the manufacturing sector causes the overall income, i.e. the GDP to fall. However, as income continues to flow in from the natural resources, it increases the salary in natural resources sector, higher salaries lead to higher taxes and the high income from tax increase the expenditure of the government and this will eventually lead to inflation. Evidence so far has indicated that countries with natural resources benefits mainly in the short-run period. In the long run a reduction, in general performance of such country is observed. Countries like Brazil, Norway and Russia

are rich in the following natural resources; oil, natural gas, coffee respectively. These countries are a good example of Dutch-Disease phenomenon. Nigeria is also one of those countries that are rich in many natural resources and is rated the 6th largest producer of crude oil. This explains the income distribution in the country and the wide gap between the rich and the poor.

2.2 Empirical Literature Review

Empirical studies on the effects of foreign exchange rates fluctuations is very extensive and covers several differing opinions on the issue, especially with the global emergence of floating exchange rate system since March 1973. Hopper and Kohlhagen (1978) undertook one of the earliest researches on the subject of the effect of foreign exchange movements on international trade. Hopper and Kohlhagen (ibid) developed a time series model to examine the impacts of foreign exchange rate volatility on trade interactions across some selected countries. The research is based on modeling empirically the bilateral trade interactions between the United States, Germany and the selected countries for a period of 10 years, 1965-1975. In their analytical model, it was assumed that a rise in the exchange rates risk or movement would decrease the level of trade interactions. Most especially, if the traders are risk averse, with this condition traders avoid transaction with those countries whose currencies have become highly volatile thereby causing a downward slope on demand for trade from such countries. Hopper and Kohlhagen (ibid) assume that the only source of uncertainty in international trade is the risk associated with the foreign exchange rates volatility. Using data collected between the periods of 1965-1975, they test for the effects of exchange rates volatility for 16 U.S-German trade flows with a panel data. Bilateral and multilateral trade relations among 10 countries were investigated and the result of their findings is; there is no statistically significant

relationship between trade interactions and foreign exchange rates movement among the countries under observation. However, they found out that exchange rate movements had relatively significant negative effects on trade relations between the United States and the United Kingdom.

De Grauwe (1988) also investigated empirically the long run consequence of exchange rate movements on international trade by employing panel data. De Grauwe proves that, the long-run movement of the real exchange rates has reduced the growth of both bilateral and multi-lateral trade significantly. According to De Grauwe (ibid), about 20 percent of the observed reduction in international trade among the observed countries is attributed to the increase in the long-run variation of real exchange rates. The research focus mainly on trade interactions among the most developed countries by employing annual data covering the period of 1973-1984. The outcome of this research is that trade has declined since 1973 and he tries to develop a model to explain the decline in the growth of trade among nations. Two regression models for two-time periods (1960-1969) and (1973-1984) was adopted to analyze the impact of fixed exchange rates and the flexible exchange rates respectively.

The flexible exchange rate tries to explain the decline in trade among these developed countries. Such as; Germany, France, the United Kingdom, Belgium, the United States of America, Italy, the Netherlands, Japan, Switzerland and Canada. The results of the estimation indicate that exchange rate movements have negative effect in the second period of the flexible exchange rate. De Grauwe (ibid) concluded

that, the huge variability of exchange rates has considerable negative impact on the trade interactions in the countries under observation.

In contrast, Corbo and Caballero (1989) have argued that, uncertainty associated with exchange rate will increase exports with the assumption of risk neutrality. They demonstrated that in perfect competition, convexity of profit functions to the real exchange rate, fixed capital, and exports is a function of the uncertainty associated with exchange rate. Their rationalization is that: when the real-exchange rate movements are adverse, the firm will produce in smaller quantities and naturally, they will have more capital. When movements in real exchange rate are favorable, firms will produce in larger quantities and will need more capital. To support this assertion, Vries and Viaene (1992) argued that given that traders are on the opposite sides of trade, the movement in exchange rate could actually leads to positive outcome on one of the traders. Many researchers also assume that exchange rates volatility could be beneficial since, exchange rates uncertainty raises the risk for some traders and for some, it provide a chance to earn extra income.

Researches that are more recent have focused on the stabilization of the financial market performance as it relates predominantly to emerging countries. Frankel (2003), Calvo and Vegh (2004), Eichengreen et al (1999), Edwards and Savastano (2000), Barro and Gordon (1983) on one hand argued that, a fixed rate system can enhance trade relations and productivity by providing the much needed credibility for monetary policy and enhancing the development of financial markets, on the other hand they indicated that a fixed exchange rate system could slow down the much needed price adjustment, which frequently leads to speculative attacks.

As observed by Reinhart and Calvo (2002), most emerging countries' economy suffers from the fear of floating. However, their fixed exchange rate system often results in crashes when there is an unexpected stop of foreign capital flow. Evident from Latin America, East Asia and the sub-Saharan African countries has been noted by Calvo (2003). It is not a surprise that there is no much consensus on the question of appropriate regime option Montiel (2003), Montiel and Ostry (1991) and Frankel et al (2001).

De Grauwe (ibid) further noted that exchange rate instability decreases the overall utility derived from exports, but would however increased exports of goods and services if the marginal utility of export increases. Philip (1996) however concluded that, the more a country devalues its currency, the higher the returns of the farmers, which consequently leads to an improvement in agricultural produce and exports. The implication is that if a country devalues its currency, it decreases the relative prices of local tradable goods compared to the prices of foreign goods. This induces increased demand by foreigners for the product of a country (substitution effect). Arise in exchange rates will eventually shrink the real income of the domestic consumer and increases the income of the foreign consumer (income effect). The real income thus reinforces the substitution effect to stimulate export response when a country devalues its currency.

Ozo-Eson (1984) investigated the import determinants, utilizing a monetarist import technique, which incorporates supply of real money balances in the traditional import model. The result indicated that money supply significantly influences import demands.

Iyoha (2003) also argued that, economic fundamentals like growth rate in GDP, inflation rate, balance of payments, foreign exchange reserve level, the growth of external debt and the growth of monetary and credit aggregates are the main factors that determine the exchange rate movements.

Itsede (2003) study the competitiveness and the behavior of exchange rate. Accordingly, due to high increase in prices of goods and services, the effect of inflation was found to be significant in generating a substantial impact on the economic performance. The conclusion of the study is that, the parallel exchange rate, lending rate and prices of goods and services were the main causes of fluctuations in the official foreign exchange rate.

Obadan (2006) on the other hand, summarized the factors, which causes disequilibrium of the real exchange rate in Nigeria, such as fragile production base, high debt burden, weak non-oil export revenue, import based production structure, expansionary fiscal and monetary policies, excess demand for foreign currency, crude oil income fluctuations, unregulated trade policy, speculative activities and sharp practices of foreign exchange marketers.

In the views of Oladipupo and Onotaniyohuwo, (2011) changes in exchange rate have direct impact on demand and supply of goods, investment, employment and on the distribution of income and wealth. They argued that, the goal of the exchange rate policy is to enhance the competitiveness of the economy and facilitate adjustment to exogenous shocks. Obadan (ibid), highlighted that exchange rate policy can help to strengthen a weak external sector by setting an optimal level of exchange rate to

enhance efficient allocation of resources, given its relative scarcity in developing economies.

Ndungu (1993) in an effort to analyze the fluctuation in inflation in Kenya implemented a six-variable model namely; foreign exchange rate index, domestic price level, real output, money supply, foreign price index and interest rate. The observation is that exchange rate and inflation were interdependent to each other. A similar result was also achieved in the comprehensive and recent study of Ndungu (1997).

Diaz and Rodriguez (1995) also adopted a six-variable model including output, the Solow model, exchange rate depreciation, real wage growth, the rate of inflation and the monetary growth, in an effort to analyze changes in the Peruvian productivity. The result of their study is that productivity performance could largely be explained by its own shocks, however it was negatively affected by increase in exchange rate depreciation.

Odusola and Akinlo (2001) conducted a study, which examined the links in inflation, exchange rate, and productivity in Nigeria. A structural Vector Autoregressive method was employed which captured the connections between productivity and exchange rate. The result shows a contractionary effect of the parallel exchange rate on productivity for the short run. Parallel exchange rate, prices and lending rate were established to be significant sources of distress in the official exchange rate. The researchers suggested that the Central Bank of Nigeria should put forward more concerted efforts towards controlling the activities of the parallel market and introducing monetary policies, which would boost economic growth.

Eme and Johnson (2012) recently carried out another research by using a quarterly data from1986-2010 and discovered that the continuous depreciation of the currency trended with changes in the fundamental macroeconomic variables such as fiscal deficit, inflation and the gross domestic product growth. They observe that during the period of high volatility of the exchange rate, inflation rate was higher than expected which was reversed in the period of relatively stable exchange rate. The result of the regression analysis indicated that a causal relationship exist between the fluctuations in the exchange rate and other macro-economic variables that were included. Thus, a significant relationship exists between economic growth and exchange rate in Nigeria.

Chuke (2012) also recently undertook a similar study by using annual data of 52years (1960-2011) and modeled a regression equation to ascertain short and long run equilibrium between the Nigeria naira against the US dollars and the changes in GDP, balance of payments, external reserves, consumer price index (CPI), deposit rates and interest rates. Data was gathered from the statistical bulletin of the CBN, the IMF and the World Bank, world economic indicator. The model was regressed using the ordinary least square model to estimate the parameters of the equation and examine the joint effects of the independent variables. The result from this regression shows that there is no statistically significant relationship between the dependent and the independent variables. Given this result, he posed the question: what then drives the exchange rate movement in Nigeria? According to Chuke, it is the activities of the speculators that are responsible for benchmarking the naira exchange rate against the United States dollar. Based on this suspicion he suggested that the Nigerian government should set in motion a platform for measuring the strength of her

currency against the United States dollar. One of the suggested options is to increase the interest rate to encourage higher savings in Nigeria through investments instead of spending huge capital on import. This will give room for enough savings that can be mobilized by banks in Nigeria for onward lending to various productive units for investment. It will enhance the export capability of Nigeria, which in turn can generate more foreign earnings that will increase the supply side of foreign exchange market.

Oyovwi (2012) in his empirical analysis applied the Vector Error Correction (VEC) model for the period of 1960-2011. The outcome of the Vector Error Correction indicated that, real exchange rate volatility does not have significant effect on Nigeria's imports. This signaled that domestic consumption is tilted towards imported goods, which indicates further, that Nigeria's exports have high import content. Another implication of his finding is that devaluation as a policy mechanism to reduce trade imbalances has not discouraged huge importation in Nigeria. Thus, market participants are positively disposed towards imports irrespective of exchange rate risks. Since exchange rates volatility could not considerably explain imports, it was therefore, advised that further severe measures like outright prohibition and quantitative restrictions on importation be adopted.

Joseph and Akhanolu (2011) examined the impacts of exchange rate movements on the trade flows in Nigeria. Using annualized statistics collected for 1970 – 2009, the research estimated the impact of exchange rate movements using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH). The results of Joseph and Akhanolu (2011) study revealed that there is no statistically significant relationship

between exchange rate variability and trade in Nigeria. The result also indicated that income has an important role to play on trade interactions. Hence, they could not find any relationship between trade and the changes in exchange rates. The study, therefore recommends that those in charge of monetary policy in Nigeria should guarantee a transparent procedure of how exchange rate is determined. In addition, government should ensure stability of the exchange rate in order to stop or reduce the persistent variability in the exchange rate market. Through the diversification of the economic base, the country can produce both manufacturing and agricultural products, which will go a long way to sustain the economy and reduce the country's over reliance on import, fiscal regulation should also be strengthened. In addition, a strict monetary policy should be pursued which will ensure that money in circulation are not in excess. Finally, the Central Bank should guarantee effective control of the foreign exchange market by monitoring the activities of dealers; specifically dealers should be stopped from engaging in round tripping, so that such distortions that are observed in the foreign exchange market can be minimized. Having all these in place, there will be a free flow of trade in and out of Nigeria that would promote economic growth.

Aliyu (2008) undertake a similar study to investigate the effects of foreign exchange rate variability on non-oil export in Nigeria. The paper employed a method whereby the trade flow of agriculture and other non oil exports in Nigerian is presumed to be influenced by the important variables such as the movements in the naira exchange, fluctuations of the United States dollar, the terms of trade (TOT) and the index of openness. Using quarterly observations of some key variables from 1986-2006, the unit root tests for stationarity and the Johansen co-integration tests were conducted.

The result indicated that the movements in the exchange rate of naira reduces non-oil exports by almost 3.66 percent while similar estimated for the United States dollar volatility improve export of agriculture and other non-oil export in Nigeria by about 5.3 percent in 2003. The empirical finding shows that some of the variables were stationary in their levels while some become stationary at first difference. Co-integration results show that there is a long-run stable equilibrium relationship between the variables and the non-oil exports. The examination of the effect of the naira exchange rate and the United States dollar movements indicated that while the naira discourages non-oil exports, the US dollar was found to promote it by -0.985 and 1.829 per unit change respectively. Looking at this in the long run, it was observed that the naira exchange rate movement has a negative impact on non oil export of about -0.5 percent while on average the movement in dollar was put at 2 percent. The recommendation of the paper is that the government should pursue a stable and sustainable exchange rate policy, ensures openness of the economy to improve the export of non-oil sector, provide the basic infrastructure for rapid economic growth.

In conclusion, majority of the studies reveal that, devaluations in Nigeria increase the real exchange rate as well as the rate of depreciation, which is linked to a decline in productivity and increased inflation. The studies so far reviewed are in support of the fact that devaluation contracts the economy. However, most of the studies are concentrated on developed countries, only a few have been carried out in developing countries, particularly Nigeria. This therefore, warrants a study on the subject. This research will attempt to provide evidence of the effects of exchange rate volatility on

consumption in Nigeria. Knowledge of the degree to which exchange rate risk affect imports is important for the design of both exchange rate and trade policies.

Chapter 3

RESEARCH METHODOLOGY

3.1 Model Specification

The aim of the research is to examine the impacts of exchange rate on economic growth, the gross domestic product. Time series econometric methodology was adopted and implemented covering the period 1960-2012. Nigeria is an emerging small economy that is affected by the fluctuations of the world market. The model employed in the study is based on the macroeconomic model of Edward and Sebastein (2000), which include the fundamentals of the financial framework employed by the IMF. This study improve on the work of Sebastein and Edward (2000) by including exchange rate as an indicator of an open economy that involves foreign or international trade and finance.

The central aim is to find out the relationship between exchange rate and economic growth in Nigeria using the US dollar as the benchmark currency. In order to accomplish the stated objectives of the research, the hypothesis over here is to check whether there is any positive significant relationship between exchange rates and the other important economic variables under consideration such as the GDP, volume of imports and export or not. Natural logarithms of all the variables were taken since the aim of the research is to measure the change of the growth rate of GDP over the period with the changing exchange rates. The equation is presented as this;

$$(LNRGDP)_t = \beta_0 + \beta_1(LNREXR)_t + \beta_3(LNRIMP)_t + \beta_4(LNREXP)_t + \mu_t$$

where

RGDP = Real gross domestic product

REXR = Real exchange rates

RIMP = Real imports

REXP = Real exports

Ln = Natural logarithms of the variables

μ = random disturbance error term (white noise error term).

The unknown parameters to be estimated are:$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$and

t = is the time frame

Note that all variables are in constant term

3.2 Data Type and Sources

The study employs secondary data which are annual time series from 1960-2012. The data for the study are collected from the Central Bank of Nigeria (CBN) Statistical Bulletins, World Bank Economic Outlook (2013) and the International Monetary Fund (IMF) Financial Statistics (2013).

3.3 Estimation Technique

The research uses Johansen's Maximum Likelihood Estimation for the cointegration test to investigation the long run equilibrium relationships and if it is established that cointegration relationship exist among the variables, then vector error correction (VEC) procedures will be followed for the short run dynamics estimation of the model. Granger causality analyses will also be preceded before finalizing the empirical chapter. The times series properties of the variables will be examined by implementing Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The analysis is facilitated through the use of econometric software, called Eview 8. (2013).

3.4 Estimation Procedure

3.4.1 Unit Root test

Data on macroeconomic variables often appear to possess a stochastic trend which can be removed by differencing. The existence of stochastic trend affects the statistical behavior of the estimators. Consequently, it is imperative to find out the order of integration of the data. Guo (2008) indicated that variables may be stationary at their levels 1(0) or they may need repeated differencing before stationarity can be achieved [1(d), d>1]. Variables that are non-stationary in levels but however, become stationary after differencing once, which is integrated of order 1 or I(1). The model is presented by Granger (2004) as:

$$\Delta y_t = (\rho\text{-}1)\, y_{t-1} + u_t \qquad -1 \leq \rho \leq 1$$

$$dy_{t-1 + Ut}$$

There are many other methods to check for the stationarity of a time series but for the purpose of this research the stochastic trend of the variable would be examined by employing the Augmented Dickey-Fuller (ADF) unit root test for stationarity and the Phillips-Perron (PP) unit root test. In the Augmented Dickey Fuller test, the hypothesis:

$d = 0$ *or* $\rho = 1$

where $d = (\rho - 1)$

of non-stationarity against the alternative of stationary:

$-1 \leq \rho \leq 1$.

While on the other hand, the Philip-Perron test employs a nonparametric statistical technique to explain the serial correlation in the error term without the lagged difference, as it is usually done for ADF test.

3.4.2 Cointegration Estimation

The study uses the Johansen co-integration analysis to identify the long-run relationships among the variables. The aim of the co-integration test is to ascertain whether a group of non-stationary series is co-integrated, that is, if they have long run equilibrium relationship or not. The test procedure as described by Granger (2004) is presented as follows .In our study, the existence of co-integration between the regressand and the regressors were assessed. This required running a Johansen co-integration test based on VAR model of the equations. The Johansen Maximum Likelihood procedure is preceded by an estimation of a vector autoregressive (VAR) model at its optimal lag length since the procedure is very sensitive to the appropriate lag length. The study uses the Johansen's co-integration analysis to identify the long run relationships among the variables. The aim of the co-integration test is to determine whether a group of non-stationary series is co-integrated or not and as a starting point, the presence of a co-integrating relation forms the basis of the VEC specification. Soyibo and Olayiwola (2000) suggest that the short-run interactions and the adjustment to long-run equilibrium are important because of the policy implications. Therefore, the vector error correction model (ECM) was applied to analyze the short-run dynamics.

3.4.3 Vector Error Correction (VEC) Estimations

The vector error correction mechanism (VECM) used by Engle and Granger (1980) corrects for the disequilibrium in the short-run in moving to the long run equilibrium. The Vector Error Correction means the 'reconciliation of the short run behavior of an economic variable with its long run behavior' (Gujarati, 2011). This implies the correction of the error term disturbance between long-run and short-run demand dynamics. The ECM can be estimated when series are non-stationary but co-

integrated. One method to estimate the error correction model is to use least squares method to estimate the co-integrating relationship: $y_t = B_1 + B_{2Xt}$and then use the lagged residuals $e_{t-1} = Y_{t-1} - B_1 - B_2 x_{2t-1}$ the right hand side of the equation is the vector error correction model through estimating it with a second least squares regression.

According to James and Mark (2007), when we run the co-integration test and we observe that a long-run relationship exist among the variables, we have to know how this relationship is achieved because in the short-run there might be disequilibrium. This can be corrected by taking the error term as the "equilibrating" error term that corrects the deviations of the gross domestic product from its equilibrium value as obtain from the co-integration estimation.

The vector error correction model implies that changes in the gross domestic product depend on the changes on all the independent variables and the lagged value of the equilibrium error term. Where the error term turn-out to be zero, it implies that there is no disequilibrium between the dependent and all the independent variables. Meaning that, the long-run equilibrium relationship will be obtained from the co-integration relationship. However, if the value of the equilibrium error term is not equal to zero, this means that the relationship between the dependent and the independent variable will be out of the equilibrium. The VECM combines both the short-run and the long-run dynamics to reach the equilibrium (Gujarati, 2011). The model for VECM is presented below:

$\Delta y_t = b_0 + b_1 \Delta x_t + b_2 e_{t-1} + e_t$

The VECM equation relates the Δ in *y* to the Δ in *x* and *equilibrium* error parameter in the previous period (e_{t-1}). The Δ*x* captures the short run disequilibrium in *x* while e_{t-1} captures the adjustment towards the long run equilibrium. The statistically significant $b_2$shows what proportion of the disequilibrium in *y*in one period is corrected in the next period (i.e. the speed of adjustment).

3.4.4Granger Causality Analysis

An economic time series x_{t2} is assumed to be Granger-caused byx_{t1} if *t* x_1 aid in the prediction of x_{t2}, or if the coefficients on the lagged x_{t2}'s are statistically significant. Granger causality implied a correlation in the present value of a variable and the past value of another; this is not to say that changes in a variable result in changes in another variable. The model for the research imply Granger causality test to determine the trend or direction of causality among the variables used in this study. The procedure as stated by Granger (1969) is presented as follows:

$$X_{1t} = \sum_{i=o}^{k} B_i X_{2t-I} + \sum_{i=o}^{k} A_i X_{1t-I} + \mu_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (i)$$

$$X_{2t} = \sum_{i=o}^{k} C_j X_{2t-I} + \sum_{i=o}^{k} D_j X_{1t-i} + \mu_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (ii)$$

A, B, C and D are the parameters to be estimated. Equation (1) suggests that current X_1 is related to past values of itself (X_{1t-1}) and past values of X_{2t-1} and vice versa for equation (2). Causality from X_2 to X_1 is shown if the estimated coefficient on the X_{2t-1} in equation (1) is statistically different from 0 (i.e. $\Sigma B_i \neq 0$) and the set of estimated coefficients on the X_{1t-1} in equation (2) is not statistically different from 0 (i.e. $\Sigma D_j = 0$).The opposite is the case for causality from X_1 to X_2. Bilateral causality exists

when the sets of X_2 and X_1 coefficients are statistically dissimilar from 0 in both equations.

Chapter 4

DATA PRESENTATION AND ANALYSIS

Chapter four focuses on the actual presentation of data analyses by using the various analytical methods as stated in chapter three.Figure 4.1 gives the logs of exchange foreign rate for the period of 1960 to 2012, for a total of 54 observations. The figure shows considerable fluctuations in the exchange rate over the sample period. As can be observed, the relative exchange rate shows period of wide fluctuations for some time and periods of moderate fluctuations in other times, thus exemplifying the phenomenon of volatility clustering. The period of the fixed exchange rates, which was in the 1960s up to the late 1980s, shows considerable stable movement in the graph:

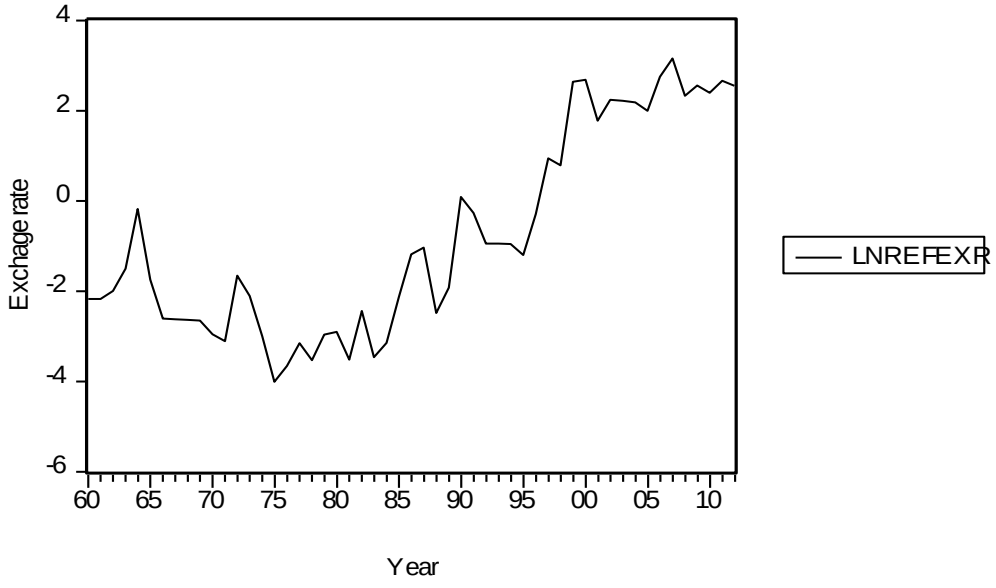

Figure 1: Exchange Rate Trend in Nigeria

4.1 Stationarity Test

Table 1: Unit Root Test

Variable	ADF Test		PP Test		Order of integration
	Level	1st diff.	Level	1st diff.	
LNREXR	-	**-7.160972**	-	**-7.788789**	1(1)
LNGDP	-	**-4.910062**	-	**-4.857747**	1(1)
LNRIMP	-	**-4.840934**	-	**-4.033441**	1(1)
LNEXP	-	**-4.782403**	-	**-5.869506**	1(1)
LNINF	**-4.518546**	-	**-4.493747**	-	1(0)

Table 1 for Unit Root Test shows that one of the variable of our model, LNINF is stationary at level while the other variables of the model are all non-stationary but at first difference. The order of integration is also shown in the table 1 which is an indication of the non stationarity for the implied variables. Hence, the linear combination of the implied non-stationary variables is jointly stationary. The unit root test results are presented in Appendix 1 alongside the implied Mckinnon critical value for the t-statitics.

4.2 Estimated Model

Cointegration test results are in appendix 2, which indicate that there is at least one cointegration relationship. The estimated model results are grouped into the following categories: Relationship between GDP &other macroeconomic variables; the relationship between GDP and other macroeconomic variable without exchange rate and the vector error correction for the short-run dynamics.

4.2.1 Johansen Cointegration Estimations for Long run Equilibrium Relationship

Eqn. 1:

$$ln(RGDP)_t = 27.28 + 0.779ln(REXP)_t - 0.896ln(RIMP)_t - 0.336ln(REXR)_t$$

t *(3.245)* *(-3.876)* *(-4.565)*

Eqn. 2:

$$ln(RGDP)_t = 28.23 + 1.333\ ln(REXP)_t - 1.497\ ln(RIMP)_t$$

t *(9.336)* *(-11.354)*

The cointegration estimation was done without inflation because it was found to be stationary at level I (0), this means that inflation as a variable is stable at level and cannot be included in the estimation of a long-run equilibrium relationship. The Johansen cointegration results have been normalized that is why it can be interpreted like the Ordinary Least Squares (OLS) method. The Johansen cointegration estimation result reveals a coefficient of determination of 0.94 for the first equation. This means that about 94% variation in the LNRGDP is explained by our explanatory variables; the LNRIMP, LNREXP and the LNREXR respectively. We also obtained a statistically significant t and F (4.52) values which justify the overall significance of the estimated model.

From the estimated equation (1), the beta coefficient of 0.779 suggest that holding all the other variables constant, on average a percentage increase in real export increase real GDP by 0.779 percent in the long run. Conversely, a percentage increase in real Import reduces real GDP growth by about 0.89 percent in the long run.

Finally, the beta coefficient of -0.336 for the estimated real exchange rate indicates that in the long run an appreciation of the domestic currency which suggest that to maintain positive growth rate in real GDP, the domestic currency must depreciate in value. The exchange rate here is defined as the amount of Naira needed to obtain one unit of the United States dollar.

The cointegration relationship suggested by our estimated model indicates that with the normalization on LNRGDP it is safe to transfer all the other variables to the right hand side of the estimated equation, in equation (1) and equation (2) respectively. From equation (1) above, the model is estimated with the inclusion of the LNEXR which suggest that to maintain a positive growth rate in RGDP in the long run the domestic currency should depreciate. A positive LNREXP and negative LNRIMP in the long run as suggested by the estimated model (1), implies that with output expansion and economic growth over the long run horizon, growth in export is stimulated raising faster than the import demand.

In equation (2), the co-integration equation is estimated with the exclusion of LNEXR with both the t value and F statistics reported as significant. The reason for the exclusion of an important variable (Exchange rates) is see the impacts of the other variables on the gross domestic product (GDP). Though this might cause omitted variable bias but due to the aim of the study, it would be necessary to omit exchange rates to see the changes on the gross domestic product which could give a better understanding of the importance of the variable (Exchange rates) on GDP. With the normalization of the estimated model on LNRDP, the estimated result further support evidence for a strong export growth in the long run and a dwindling import demand. These further provide justification for a vibrant and dynamic exchange rate policy in stimulating and maintaining long run economic growth via the application of a potent exchange rate devaluation policy.

4.3Vector Error Correction Estimations for short run dynamic model

Eqn. 1:

$$\Delta ln(GDP)_t = 27.28 + 0.452\,\Delta ln(EXP_t) - 0.474\Delta ln(IMP_t) - 0.258\Delta ln(EXR) - 0.65_{et-1}$$

t (3.522) (-2.711) (-4.994) (-4.91)

$R^2 = 0.94$. Adjusted $R^2 = 0.73$

Eqn. 2:

$$\Delta ln(GDP_t) = 0.078 + 0.362\,\Delta ln(EXP_t) - 0.484\Delta ln(IMP_{t-1}) - 0.25_{et}$$

t (2.96) (2.362) (-2.559) (-1.938)

$R^2 = 0.557$. Adjusted $R^2 = 0.09$

The regression estimated in equation 1 of 4.3 shows the vector error correction estimations for the short run dynamic models/ the result shows that the short run Δln(EXR) have significant negative effect on Δln(GDP) and that 65 percent of the disequilibrium between the actual and long run value of GDP is eliminated or corrected. Thus, 0.258 represents the short run or equilibrium elasticity of real foreign exchange rate and reveals that a one percent increase of the value real exchange rate against Nigeria naira will result in 0.258 percent decrease in real GDP in the short run.

The regression estimated equation 2 of 4.2 shows that the short run Δln(EXP) has significant positive effect on Δln(GDP) and Δln(IMP) has significant negative effect on Δln(GDP). On the average 25 percent of the disturbance between the actual and the long run value of GDP have been corrected. Thus, 0.362 and 0.484 represent the short run elasticity coefficient are found to be significant and theoretically consistent. Comparatively the speed of adjustment in equation 1 is greater than that of equation 2, this shows that real foreign exchange rate is the channel through which adjustment in economy can be made between GDP and import and export.

4.4 Pairwise Granger Causality Tests

Causal Relationship between GDP and other Macroeconomic Variables

Date: 12/25/13 Time: 22:21
Sample: 1960 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LNREXR does not Granger Cause LNGDP	51	0.93027	0.40174
LNGDP does not Granger Cause LNREXR		1.19705	0.31132
LNEXP does not Granger Cause LNGDP	50	2.19486	0.12316
LNGDP does not Granger Cause LNEXP		0.96859	0.38739
LNINF does not Granger Cause LNGDP	43	0.27711	0.75949
LNGDP does not Granger Cause LNINF		0.03192	0.96861
LNRIMP does not Granger Cause LNGDP	50	2.36266	0.10575
LNGDP does not Granger Cause LNRIMP		1.33070	0.27449
LNEXP does not Granger Cause LNREXR	50	11.3417	0.00010
LNREXR does not Granger Cause LNEXP		1.27154	0.29028
LNINF does not Granger Cause LNREEXR	43	6.14227	0.00488
LNREFEXR does not Granger Cause LNINF		0.24810	0.78153
LNRIMP does not Granger Cause LNREXR	50	13.1526	3.2E-05
LNREXR does not Granger Cause LNRIMP		0.69851	0.50264
LNINF does not Granger Cause LNEXP	42	0.27777	0.75904
LNEXP does not Granger Cause LNINF		0.18165	0.83463
LNRIMP does not Granger Cause LNEXP	50	3.37762	0.04298
LNEXP does not Granger Cause LNRIMP		3.45562	0.04017
LNRIMP does not Granger Cause LNINF	42	0.20923	0.81216
LNINF does not Granger Cause LNRIMP		1.68498	0.19937

From the table above the Null hypothesis of no granger causality is examined on the basis of both the estimated F statistic and p value at a determined significant level. We found no significant granger causality for LNREXR and LNGDP, LNEXP and LNGDP as well as for LNINF and LNGDP. From the table, null hypothesis of no granger causality is not rejected for LNIMP and LNGDP, hence a unidirectional relationship holds in this instance. The observed causality implies that the current level of import is strongly influenced by the economic growth rate reported a period ago. Our result from the table also indicates a unidirectional causality between LNEXP and LNEXR at an alpha significant level of 1 percent. This implies that the

current growth rate in export is strongly influenced by past dynamics in exchange rate.

A significant granger causality also holds for LNINF and LNREXR at 1 percent significant level. This suggests a positive correlation between growth in price level and exchange rate movement over time. We also observe a negative association between growth in import demand and changes in the growth rate of previous exchange rate movements. This further explains the negative LNREXR and positive LNRIMP obtained in our estimated co integration model.

The pairwise granger causality tests further reveals a unidirectional relationship between LNIMP and LNREXR at 1 percent significant level with no causality between LNINF and LNEXP.A significant bidirectional relationship is reported for LNIMP and LNEXP at an alpha significant level of 5 percent but with a seemingly insignificant correlation between LNIMP and LNINF.

Chapter 5

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 Summary of the findings

The aim of the research is to empirically examine the effects of the fluctuations in exchange rate on the economic growth i.e. gross domestic product in Nigeria. After the review of relevant literature, the study is situates within the premise that the gross domestic product in Nigeria is predicated by some exogenous variables. Annual time series data were collected on the important variables from 1960 to 2012. The Augmented Dickey Fuller (ADF) and Phillips-Peron Unit root tests and Johansen co-integration tests were applied.

The empirical results for the ADF test indicated evidence of non-stationarity at level for the variables except inflation; however, the series become stationarity after first difference. Evidence of co-integration among the variables was also established using the Johansen co-integration method. This means that there is a long run equilibrium condition among the variables. Since the co-integration was established among the variables, the suitable mechanism for the short-run modeling is the vector error correction (VEC) model. From the estimated Vector Error Correction model the result, indicates a reasonable pace of adjustment towards the long-run equilibrium. This implied that any short-run disturbance of the economic performance in the long-run equilibrium would adjust within some years as suggested by the evidence. By employing this in the long-run model, the fluctuations in the exchange rate of naira

were found to have a negative impact on the gross domestic product. In general, the study investigates the linkage between exchange rate and the growth of the GDP. The outcome indicated that a statistically significant relationship exist between foreign exchange rates and economic growth. The outcome of the error correction reveals that exchange rate and GDP are co-integrated and in the short run the changes in GDP adjust to changes in exchange rate. Given this result, it is important to improve the existing foreign exchange policy in Nigeria. This can improve the growth rate of the economy; however, this is only possible in the context of a coordinated broad-base economic transformation that involves complementary fiscal and monetary policies.

As we can observe in figure 4.1, the relative exchange rate indicated that there are some periods of wide fluctuations, thus exemplifying the phenomenon of volatility clustering. Table 4.1 for Unit Root Test shows that one variable is stationary at level while the rest are not stationary but at first difference.

The estimated equation 4.2 (2) shows that the short-run dynamics is tied to long-run or Equilibrium relationship between the variables. The result from the estimated equation 4.2 (2) shows that the gross domestic product is explained by its past value and import for the short term. Export and import are significant sources of distress in exchange rate. Gross domestic product, exchange rate, export, inflation and import are important determinants of current import in Nigeria. In addition, exchange rate and past inflation are major determinants of inflation dynamics in Nigeria while past export and import are important determinants of export in Nigeria.

The pairwise granger causality test, as presented in table 4.2 shows no causality, unidirectional causality and bilateral causality between x and y. Double log function was used to estimate the models. The double log estimated equation gave the best fit. The R^2 in regression-estimated equation 4.2 (1) shows that the total changes in the dependent variable is jointly explained by the independent variables. The computed *F* value show that the model is well specified and the variable have the expected signs except import. The result further shows that the explanatory variables are significant in explaining dependent variable GDP. The Johansen regression equation 4.2 (2) shows, long-run or equilibrium relationship between the selected variables.

5.2Policy Recommendations

The study recommends that government should pursue stable and sustainable foreign exchange policy, by putting in place measures, which encourages the stability of the foreign exchange rate. Efforts should also be made to improve the terms of trade, lift trade barrier for greater foreign trade interactions.

Infrastructure is still a big problem in Nigeria. In order to attract investment; both local and international, government must provide affordable and efficient infrastructure, particularly in the area of power supply, good road networks, telecommunication, transportation which are very crucial for development. When there is efficient infrastructure, it will attract investment that would bring about the diversification of the economy.

Finally, while there is nothing much that can be done to control the effects of fluctuations in dollar since the United States plays a significant role in international

trade. It is hoped that implementing these measures can promote export in Nigeria that would increase the GDP.

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APPENDICES

Appendix 1: Stationarity Test

ADF Test Statistic	**-4.910062**	**1% Critical Value***	**-4.1458**
		5% Critical Value	**-3.4987**
		10% Critical Value	**-3.1782**

***MacKinnon critical values for rejection of hypothesis of a unit root.**

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGDP,2)
Method: Least Squares
Date: 12/25/13 Time: 20:26
Sample(adjusted): 1962 2012
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	-0.667578	0.135961	-4.910062	0.0000
C	0.019619	0.019538	1.004116	0.3204
@TREND(1960)	0.000273	0.000628	0.434465	0.6659

R-squared	0.334360	Mean dependent var	0.001206
Adjusted R-squared	0.306625	S.D. dependent var	0.078846
S.E. of regression	0.065654	Akaike info criterion	-2.551810
Sum squared resid	0.206902	Schwarz criterion	-2.438173
Log likelihood	68.07116	F-statistic	12.05552
Durbin-Watson stat	1.838963	Prob(F-statistic)	0.000057

PP Test Statistic	**-4.857747**	**1% Critical Value***	**-4.1458**
		5% Critical Value	**-3.4987**
		10% Critical Value	**-3.1782**

***MacKinnon critical values for rejection of hypothesis of a unit root.**

Lag truncation for Bartlett kernel: 3 (Newey-West suggests: 3)	
Residual variance with no correction	**0.004057**
Residual variance with correction	**0.003821**

Phillips-Perron Test Equation
Dependent Variable: D(LNGDP,2)
Method: Least Squares
Date: 12/25/13 Time: 20:27
Sample(adjusted): 1962 2012
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	-0.667578	0.135961	-4.910062	0.0000
C	0.019619	0.019538	1.004116	0.3204
@TREND(1960)	0.000273	0.000628	0.434465	0.6659

R-squared	0.334360	Mean dependent var	0.001206
Adjusted R-squared	0.306625	S.D. dependent var	0.078846
S.E. of regression	0.065654	Akaike info criterion	-2.551810
Sum squared resid	0.206902	Schwarz criterion	-2.438173
Log likelihood	68.07116	F-statistic	12.05552
Durbin-Watson stat	1.838963	Prob(F-statistic)	0.000057

ADF Test Statistic	-7.160972	1% Critical Value*	-4.1498
		5% Critical Value	-3.5005
		10% Critical Value	-3.1793

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNREFEXR,2)
Method: Least Squares
Date: 12/25/13 Time: 20:30
Sample(adjusted): 1963 2012
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREFEXR(-1))	-1.452890	0.202890	-7.160972	0.0000
D(LNREFEXR(-1),2)	0.349558	0.138303	2.527489	0.0150
C	-0.072760	0.229247	-0.317389	0.7524
@TREND(1960)	0.007479	0.007452	1.003671	0.3208

R-squared	0.594198	Mean dependent var	-0.005645
Adjusted R-squared	0.567732	S.D. dependent var	1.144457
S.E. of regression	0.752447	Akaike info criterion	2.345646
Sum squared resid	26.04413	Schwarz criterion	2.498608
Log likelihood	-54.64116	F-statistic	22.45190
Durbin-Watson stat	2.026150	Prob(F-statistic)	0.000000

PP Test Statistic	-7.788789	1% Critical Value*	-4.1458
		5% Critical Value	-3.4987
		10% Critical Value	-3.1782

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3 (Newey-West suggests: 3)	
Residual variance with no correction	0.582451
Residual variance with correction	0.352216

Phillips-Perron Test Equation
Dependent Variable: D(LNREFEXR,2)
Method: Least Squares
Date: 12/25/13 Time: 20:30
Sample(adjusted): 1962 2012
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNREFEXR(-1))	-1.076473	0.144171	-7.466647	0.0000
C	-0.035682	0.230240	-0.154976	0.8775
@TREND(1960)	0.005022	0.007522	0.667590	0.5076

R-squared	0.537390	Mean dependent var	-0.002083
Adjusted R-squared	0.518114	S.D. dependent var	1.133241
S.E. of regression	0.786673	Akaike info criterion	2.415014
Sum squared resid	29.70501	Schwarz criterion	2.528651
Log likelihood	-58.58286	F-statistic	27.87951
Durbin-Watson stat	2.049010	Prob(F-statistic)	0.000000

ADF Test Statistic	-4.782403	1% Critical Value*	-4.1540
		5% Critical Value	-3.5025
		10% Critical Value	-3.1804

***MacKinnon critical values for rejection of hypothesis of a unit root.**

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXP,2)
Method: Least Squares
Date: 12/25/13 Time: 20:32
Sample(adjusted): 1963 2011
Included observations: 49 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXP(-1))	-0.942374	0.197050	-4.782403	0.0000
D(LNEXP(-1),2)	0.097440	0.149853	0.650239	0.5188
C	0.034034	0.098161	0.346714	0.7304
@TREND(1960)	-0.002599	0.003275	-0.793646	0.4316

R-squared	0.430829	Mean dependent var	0.004587
Adjusted R-squared	0.392884	S.D. dependent var	0.407290
S.E. of regression	0.317350	Akaike info criterion	0.620486
Sum squared resid	4.532004	Schwarz criterion	0.774921
Log likelihood	-11.20192	F-statistic	11.35413
Durbin-Watson stat	1.959034	Prob(F-statistic)	0.000011

PP Test Statistic	-5.869506	1% Critical Value*	-4.1498
		5% Critical Value	-3.5005
		10% Critical Value	-3.1793

***MacKinnon critical values for rejection of hypothesis of a unit root.**

Lag truncation for Bartlett kernel: 3 (Newey-West suggests: 3)	
Residual variance with no correction	0.091638
Residual variance with correction	0.088420

Phillips-Perron Test Equation
Dependent Variable: D(LNEXP,2)
Method: Least Squares
Date: 12/25/13 Time: 20:58
Sample(adjusted): 1962 2011
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXP(-1))	-0.856998	0.145516	-5.889386	0.0000
C	0.022145	0.092508	0.239388	0.8118
@TREND(1960)	-0.002079	0.003093	-0.672186	0.5048

R-squared	0.424861	Mean dependent var	0.003282
Adjusted R-squared	0.400387	S.D. dependent var	0.403218
S.E. of regression	0.312230	Akaike info criterion	0.567972
Sum squared resid	4.581920	Schwarz criterion	0.682693
Log likelihood	-11.19930	F-statistic	17.35972
Durbin-Watson stat	1.960446	Prob(F-statistic)	0.000002

ADF Test Statistic	-4.518546	1% Critical Value*	-4.1678
		5% Critical Value	-3.5088
		10% Critical Value	-3.1840

***MacKinnon critical values for rejection of hypothesis of a unit root.**

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNCPI)
Method: Least Squares
Date: 12/25/13 Time: 21:04
Sample(adjusted): 1962 2012
Included observations: 46
Excluded observations: 5 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCPI(-1)	-0.521618	0.115439	-4.518546	0.0000
C	1.402673	0.332959	4.212749	0.0001
@TREND(1960)	-0.000192	0.006994	-0.027394	0.9783

R-squared	0.334725	Mean dependent var	0.052922
Adjusted R-squared	0.303782	S.D. dependent var	0.757279
S.E. of regression	0.631871	Akaike info criterion	1.982731
Sum squared resid	17.16823	Schwarz criterion	2.101990
Log likelihood	-42.60281	F-statistic	10.81747
Durbin-Watson stat	1.752801	Prob(F-statistic)	0.000157

PP Test Statistic	-4.493747	1% Critical Value*	-4.1678
		5% Critical Value	-3.5088
		10% Critical Value	-3.1840

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3 (Newey-West suggests: 3)	
Residual variance with no correction	0.373222
Residual variance with correction	0.338297

Phillips-Perron Test Equation
Dependent Variable: D(LNCPI)
Method: Least Squares
Date: 12/25/13 Time: 21:04
Sample(adjusted): 1962 2012
Included observations: 46
Excluded observations: 5 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCPI(-1)	-0.521618	0.115439	-4.518546	0.0000
C	1.402673	0.332959	4.212749	0.0001
@TREND(1960)	-0.000192	0.006994	-0.027394	0.9783

R-squared	0.334725	Mean dependent var	0.052922
Adjusted R-squared	0.303782	S.D. dependent var	0.757279
S.E. of regression	0.631871	Akaike info criterion	1.982731
Sum squared resid	17.16823	Schwarz criterion	2.101990
Log likelihood	-42.60281	F-statistic	10.81747
Durbin-Watson stat	1.752801	Prob(F-statistic)	0.000157

ADF Test Statistic	-4.033441	1% Critical Value*	-4.1540
		5% Critical Value	-3.5025
		10% Critical Value	-3.1804

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNRIMP,2)
Method: Least Squares
Date: 12/25/13 Time: 21:08

Sample(adjusted): 1963 2011
Included observations: 49 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRIMP(-1))	-0.723941	0.179485	-4.033441	0.0002
D(LNRIMP(-1),2)	0.043396	0.151122	0.287158	0.7753
C	-0.005489	0.078560	-0.069867	0.9446
@TREND(1960)	-0.001085	0.002611	-0.415644	0.6796

R-squared	0.341624	Mean dependent var	0.007366
Adjusted R-squared	0.297733	S.D. dependent var	0.304445
S.E. of regression	0.255129	Akaike info criterion	0.184015
Sum squared resid	2.929094	Schwarz criterion	0.338450
Log likelihood	-0.508375	F-statistic	7.783342
Durbin-Watson stat	1.973259	Prob(F-statistic)	0.000272

PP Test Statistic	-4.840934	1% Critical Value*	-4.1498
		5% Critical Value	-3.5005
		10% Critical Value	-3.1793

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3 (Newey-West suggests: 3)	
Residual variance with no correction	0.058977
Residual variance with correction	0.055189

Phillips-Perron Test Equation
Dependent Variable: D(LNRIMP,2)
Method: Least Squares
Date: 12/25/13 Time: 21:08
Sample(adjusted): 1962 2011
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRIMP(-1))	-0.691985	0.141146	-4.902630	0.0000
C	-0.016104	0.074072	-0.217416	0.8288
@TREND(1960)	-0.000707	0.002471	-0.285926	0.7762

R-squared	0.339119	Mean dependent var	0.005057
Adjusted R-squared	0.310996	S.D. dependent var	0.301765
S.E. of regression	0.250484	Akaike info criterion	0.127277
Sum squared resid	2.948873	Schwarz criterion	0.241999
Log likelihood	-0.181929	F-statistic	12.05858
Durbin-Watson stat	1.950413	Prob(F-statistic)	0.000059

Appendix 2: Coıntegratıon results

Date: 01/09/14 Time: 12:18
Sample (adjusted): 1962 2011
Included observations: 50 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDP LNEXP LNRIMP LNREXR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.377658	48.40700	47.85613	0.0443
At most 1	0.326027	24.69377	29.79707	0.1727
At most 2	0.093873	4.965502	15.49471	0.8125
At most 3	0.000734	0.036701	3.841466	0.8480

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.377658	23.71324	27.58434	0.1451
At most 1	0.326027	19.72826	21.13162	0.0776
At most 2	0.093873	4.928801	14.26460	0.7508
At most 3	0.000734	0.036701	3.841466	0.8480

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGDP	LNEXP	LNRIMP	LNREXR
3.386627	-6.551901	6.853379	-0.076768
-4.049301	-1.765849	0.739323	-2.392015
0.863234	0.182730	0.570516	-0.919205
2.349863	-1.532830	1.423932	-0.149590

Unrestricted Adjustment Coefficients (alpha):

D(LNGDP)	0.005789	0.007333	-0.017859	0.000504
D(LNEXP)	0.087464	0.016020	-0.054312	-0.005170
D(LNRIMP)	-0.056453	0.009160	-0.031145	-0.004764
D(LNREXR)	-0.046010	0.133441	0.020287	-0.001674

1 Cointegrating Equation(s): Log likelihood 89.03604

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNEXP	LNRIMP	LNREXR
1.000000	-1.934639	2.023659	-0.022668

	(0.35420)	(0.32785)	(0.12237)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	0.019604		
	(0.03214)		
D(LNEXP)	0.296207		
	(0.14553)		
D(LNRIMP)	-0.191186		
	(0.11041)		
D(LNREXR)	-0.155820		
	(0.13147)		

2 Cointegrating Equation(s): Log likelihood 98.90018

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNEXP	LNRIMP	LNREXR
1.000000	0.000000	0.223250	0.477892
		(0.03346)	(0.06885)
0.000000	1.000000	-0.930618	0.258735
		(0.02459)	(0.05061)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.010091	-0.050876
	(0.04976)	(0.06396)
D(LNEXP)	0.231339	-0.601342
	(0.22648)	(0.29113)
D(LNRIMP)	-0.228279	0.353699
	(0.17195)	(0.22104)
D(LNREXR)	-0.696162	0.065820
	(0.17526)	(0.22529)

3 Cointegrating Equation(s): Log likelihood 101.3646

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNEXP	LNRIMP	LNREXR
1.000000	0.000000	0.000000	1.039843
			(0.29198)
0.000000	1.000000	0.000000	-2.083759
			(1.16070)
0.000000	0.000000	1.000000	-2.517139
			(1.24894)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.025508	-0.054140	0.034904
	(0.04832)	(0.06132)	(0.06248)
D(LNEXP)	0.184456	-0.611267	0.580280
	(0.22527)	(0.28588)	(0.29130)
D(LNRIMP)	-0.255164	0.348008	-0.397891
	(0.17242)	(0.21881)	(0.22295)
D(LNREXR)	-0.678649	0.069527	-0.205097
	(0.17684)	(0.22442)	(0.22867)

Date: 01/09/14 Time: 12:25
Sample (adjusted): 1962 2011
Included observations: 50 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDP LNEXP LNRIMP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.399677	30.79866	29.79707	0.0382
At most 1	0.099589	5.284313	15.49471	0.7779
At most 2	0.000782	0.039130	3.841466	0.8432

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.399677	25.51435	21.13162	0.0113
At most 1	0.099589	5.245183	14.26460	0.7106
At most 2	0.000782	0.039130	3.841466	0.8432

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGDP	LNEXP	LNRIMP
3.270703	-6.441426	6.667053
2.639161	0.024014	1.061739
2.438290	-1.227143	1.151112

Unrestricted Adjustment Coefficients (alpha):

D(LNGDP)	0.008011	-0.018892	0.000458
D(LNEXP)	0.098470	-0.052277	-0.005524
D(LNRIMP)	-0.060423	-0.031614	-0.005034

1 Cointegrating Equation(s): Log likelihood 87.20481

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNEXP	LNRIMP
1.000000	-1.969431	2.038415
	(0.24095)	(0.21682)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	0.026203
	(0.03064)
D(LNEXP)	0.322065
	(0.13878)
D(LNRIMP)	-0.197627
	(0.10672)

2 Cointegrating Equation(s): Log likelihood 89.82740

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNEXP	LNRIMP
1.000000	0.000000	0.409826
		(0.11888)
0.000000	1.000000	-0.826934
		(0.06354)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.023656	-0.052059
	(0.03755)	(0.05755)
D(LNEXP)	0.184099	-0.635541
	(0.17529)	(0.26866)
D(LNRIMP)	-0.281061	0.388454
	(0.13570)	(0.20798)

Vector Error Correction Estimates
Date: 01/09/14 Time: 12:13
Sample (adjusted): 1969 2011
Included observations: 43 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNGDP(-1)	1.000000
LNEXP(-1)	-0.779177 (0.24012) [-3.24497]
LNRIMP(-1)	0.896746 (0.23134) [3.87637]
LNREXR(-1)	0.336427 (0.07370) [4.56508]
C	-27.28686

Error Correction:	D(LNGDP)	D(LNEXP)	D(LNRIMP)	D(LNREXR)
CointEq1	0.652843 (0.13272) [4.91892]	1.415955 (1.14903) [1.23230]	1.181887 (1.01404) [1.16553]	-1.409997 (1.30293) [-1.08218]
D(LNGDP(-1))	-0.806699 (0.28063) [-2.87459]	-2.170487 (2.42956) [-0.89337]	-1.021210 (2.14412) [-0.47628]	0.901582 (2.75496) [0.32726]
D(LNGDP(-2))	-1.187748 (0.18534) [-6.40852]	-2.988496 (1.60457) [-1.86249]	-0.951648 (1.41605) [-0.67204]	2.250692 (1.81948) [1.23700]
D(LNGDP(-3))	-0.658042 (0.19806) [-3.32238]	-0.137768 (1.71473) [-0.08034]	-1.364526 (1.51328) [-0.90170]	-0.092170 (1.94440) [-0.04740]
D(LNGDP(-4))	-0.577405	-0.884876	0.853770	0.436971

	(0.19900)	(1.72281)	(1.52041)	(1.95356)
	[-2.90158]	[-0.51362]	[0.56154]	[0.22368]
D(LNGDP(-5))	-1.208733	-2.675223	-1.538574	-0.541328
	(0.22313)	(1.93171)	(1.70476)	(2.19043)
	[-5.41727]	[-1.38490]	[-0.90252]	[-0.24713]
D(LNGDP(-6))	-0.188955	-2.100578	0.467819	-0.129556
	(0.17260)	(1.49432)	(1.31876)	(1.69446)
	[-1.09473]	[-1.40571]	[0.35474]	[-0.07646]
D(LNGDP(-7))	-0.777895	-1.609910	-0.412937	0.391566
	(0.18524)	(1.60368)	(1.41527)	(1.81847)
	[-4.19948]	[-1.00389]	[-0.29177]	[0.21533]
D(LNGDP(-8))	-0.091913	-2.556492	-0.203399	0.043958
	(0.16729)	(1.44832)	(1.27816)	(1.64230)
	[-0.54942]	[-1.76515]	[-0.15913]	[0.02677]
D(LNEXP(-1))	0.452490	0.822083	1.283966	-1.185878
	(0.12846)	(1.11217)	(0.98151)	(1.26113)
	[3.52233]	[0.73917]	[1.30816]	[-0.94033]
D(LNEXP(-2))	0.361557	-0.389673	1.352444	-0.828357
	(0.13375)	(1.15794)	(1.02190)	(1.31302)
	[2.70324]	[-0.33652]	[1.32347]	[-0.63088]
D(LNEXP(-3))	0.304016	-1.109950	0.743388	-0.190594
	(0.15116)	(1.30865)	(1.15491)	(1.48393)
	[2.01124]	[-0.84816]	[0.64368]	[-0.12844]
D(LNEXP(-4))	0.562997	-0.205970	0.269054	-0.421046
	(0.13683)	(1.18457)	(1.04540)	(1.34323)
	[4.11469]	[-0.17388]	[0.25737]	[-0.31346]
D(LNEXP(-5))	0.683749	1.032248	0.655544	-0.297804
	(0.13016)	(1.12689)	(0.99450)	(1.27782)
	[5.25300]	[0.91601]	[0.65917]	[-0.23306]
D(LNEXP(-6))	0.489959	0.769351	0.271481	-0.382605
	(0.10955)	(0.94839)	(0.83697)	(1.07541)
	[4.47264]	[0.81122]	[0.32436]	[-0.35577]
D(LNEXP(-7))	0.444296	1.579210	0.463118	-0.384112
	(0.08611)	(0.74546)	(0.65788)	(0.84531)
	[5.15987]	[2.11843]	[0.70395]	[-0.45441]
D(LNEXP(-8))	0.248732	1.251845	0.364564	-0.497489
	(0.05648)	(0.48895)	(0.43151)	(0.55444)
	[4.40410]	[2.56026]	[0.84486]	[-0.89728]
D(LNRIMP(-1))	-0.193755	0.594410	-1.132989	1.435164
	(0.17197)	(1.48879)	(1.31388)	(1.68819)
	[-1.12671]	[0.39926]	[-0.86232]	[0.85012]
D(LNRIMP(-2))	-0.474697	0.849003	-1.344870	0.928211
	(0.17507)	(1.51568)	(1.33761)	(1.71869)
	[-2.71144]	[0.56014]	[-1.00543]	[0.54007]
D(LNRIMP(-3))	-0.485142	0.343719	-0.884916	0.026757
	(0.17901)	(1.54977)	(1.36769)	(1.75733)

	[-2.71016]	[0.22179]	[-0.64701]	[0.01523]
D(LNRIMP(-4))	-0.711902	0.242108	-0.542859	0.514782
	(0.16330)	(1.41374)	(1.24764)	(1.60309)
	[-4.35957]	[0.17125]	[-0.43511]	[0.32112]
D(LNRIMP(-5))	-0.820163	-1.759564	-0.567269	0.829618
	(0.14782)	(1.27972)	(1.12937)	(1.45112)
	[-5.54850]	[-1.37496]	[-0.50229]	[0.57171]
D(LNRIMP(-6))	-0.685273	-1.804584	-1.117184	0.270837
	(0.11971)	(1.03642)	(0.91466)	(1.17524)
	[-5.72424]	[-1.74116]	[-1.22142]	[0.23045]
D(LNRIMP(-7))	-0.204898	-0.741178	-0.116969	0.150958
	(0.07943)	(0.68764)	(0.60685)	(0.77974)
	[-2.57971]	[-1.07786]	[-0.19275]	[0.19360]
D(LNRIMP(-8))	-0.468310	-1.696653	-0.377098	0.418369
	(0.07564)	(0.65487)	(0.57793)	(0.74258)
	[-6.19115]	[-2.59083]	[-0.65250]	[0.56340]
D(LNREXR(-1))	-0.258553	-0.357547	-0.119599	0.082941
	(0.05177)	(0.44819)	(0.39553)	(0.50822)
	[-4.99438]	[-0.79776]	[-0.30237]	[0.16320]
D(LNREXR(-2))	-0.282621	-1.600566	-0.340291	0.588764
	(0.05193)	(0.44961)	(0.39678)	(0.50982)
	[-5.44207]	[-3.55994]	[-0.85763]	[1.15484]
D(LNREXR(-3))	-0.080513	-0.343068	-0.745659	-0.061266
	(0.04783)	(0.41409)	(0.36544)	(0.46955)
	[-1.68330]	[-0.82848]	[-2.04043]	[-0.13048]
D(LNREXR(-4))	0.155661	0.786841	0.456275	-0.232196
	(0.06573)	(0.56903)	(0.50218)	(0.64525)
	[2.36829]	[1.38277]	[0.90859]	[-0.35986]
D(LNREXR(-5))	-0.301719	-1.063564	-0.275555	0.044915
	(0.06531)	(0.56545)	(0.49902)	(0.64118)
	[-4.61958]	[-1.88092]	[-0.55220]	[0.07005]
D(LNREXR(-6))	0.017207	-0.162816	-0.112502	-0.009510
	(0.03706)	(0.32088)	(0.28318)	(0.36386)
	[0.46427]	[-0.50741]	[-0.39728]	[-0.02614]
D(LNREXR(-7))	-0.003666	0.131309	-0.203110	0.007889
	(0.03483)	(0.30154)	(0.26611)	(0.34192)
	[-0.10524]	[0.43546]	[-0.76325]	[0.02307]
D(LNREXR(-8))	0.021093	-0.278811	-0.166352	0.032686
	(0.03876)	(0.33554)	(0.29612)	(0.38048)
	[0.54423]	[-0.83094]	[-0.56178]	[0.08591]
C	0.120298	0.310084	-0.095111	-0.061202
	(0.02365)	(0.20471)	(0.18066)	(0.23213)
	[5.08744]	[1.51471]	[-0.52645]	[-0.26365]
R-squared	0.943045	0.836700	0.814030	0.734856
Adj. R-squared	0.734211	0.237933	0.132139	-0.237341
Sum sq. resids	0.010040	0.752553	0.586111	0.967639

S.E. equation	0.033401	0.289166	0.255193	0.327895
F-statistic	4.515758	1.397372	1.193783	0.755872
Log likelihood	118.7758	25.96355	31.33772	20.55872
Akaike AIC	-3.943061	0.373789	0.123827	0.625176
Schwarz SC	-2.550484	1.766365	1.516404	2.017753
Mean dependent	0.045951	-0.046939	-0.060123	-0.043543
S.D. dependent	0.064787	0.331246	0.273933	0.294775

Determinant resid covariance (dof adj.)	2.37E-08
Determinant resid covariance	4.55E-11
Log likelihood	267.9131
Akaike information criterion	-5.949446
Schwarz criterion	-0.215306

WITHOUT EXCHANGE RATES

Vector Error Correction Estimates
Date: 01/09/14 Time: 12:22
Sample (adjusted): 1968 2011
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNGDP(-1)	1.000000
LNEXP(-1)	-1.333347 (0.14281) [-9.33667]
LNRIMP(-1)	1.497973 (0.13193) [11.3543]
C	-28.22893

Error Correction:	D(LNGDP)	D(LNEXP)	D(LNRIMP)
CointEq1	-0.251302 (0.12960) [-1.93899]	0.454382 (0.72024) [0.63087]	0.216398 (0.51611) [0.41929]
D(LNGDP(-1))	0.690897 (0.21469) [3.21811]	0.933817 (1.19308) [0.78269]	-0.011435 (0.85494) [-0.01337]
D(LNGDP(-2))	-0.280369 (0.25772) [-1.08787]	-0.768751 (1.43222) [-0.53676]	0.414211 (1.02630) [0.40360]
D(LNGDP(-3))	0.201880 (0.27000) [0.74769]	1.256282 (1.50047) [0.83726]	-0.179920 (1.07521) [-0.16734]
D(LNGDP(-4))	-0.195595 (0.26615) [-0.73489]	0.128532 (1.47908) [0.08690]	0.824132 (1.05988) [0.77757]

D(LNGDP(-5))	-0.048469	0.562964	-0.428278
	(0.26348)	(1.46421)	(1.04922)
	[-0.18396]	[0.38448]	[-0.40819]
D(LNGDP(-6))	0.022950	-0.840386	0.519519
	(0.25665)	(1.42627)	(1.02203)
	[0.08942]	[-0.58922]	[0.50832]
D(LNGDP(-7))	-0.368396	-0.289440	0.470662
	(0.22732)	(1.26325)	(0.90522)
	[-1.62063]	[-0.22912]	[0.51994]
D(LNEXP(-1))	-0.362489	0.184710	0.770822
	(0.15343)	(0.85265)	(0.61099)
	[-2.36255]	[0.21663]	[1.26159]
D(LNEXP(-2))	-0.309996	-0.300218	0.524319
	(0.14796)	(0.82224)	(0.58920)
	[-2.09516]	[-0.36512]	[0.88989]
D(LNEXP(-3))	-0.195864	-0.340281	0.565146
	(0.13716)	(0.76221)	(0.54618)
	[-1.42804]	[-0.44644]	[1.03472]
D(LNEXP(-4))	-0.170384	-0.958824	-0.163277
	(0.13924)	(0.77379)	(0.55448)
	[-1.22366]	[-1.23912]	[-0.29447]
D(LNEXP(-5))	-0.001444	-0.310664	0.048707
	(0.13848)	(0.76956)	(0.55145)
	[-0.01043]	[-0.40369]	[0.08833]
D(LNEXP(-6))	-0.021859	-0.490225	-0.328992
	(0.11051)	(0.61415)	(0.44008)
	[-0.19780]	[-0.79822]	[-0.74757]
D(LNEXP(-7))	0.040479	0.190291	0.019606
	(0.08397)	(0.46664)	(0.33439)
	[0.48207]	[0.40779]	[0.05863]
D(LNRIMP(-1))	0.484391	0.288522	-0.536651
	(0.18927)	(1.05182)	(0.75371)
	[2.55925]	[0.27431]	[-0.71201]
D(LNRIMP(-2))	0.289520	0.357053	-0.558391
	(0.17225)	(0.95721)	(0.68591)
	[1.68086]	[0.37302]	[-0.81408]
D(LNRIMP(-3))	0.267631	0.324067	-0.486356
	(0.16507)	(0.91734)	(0.65735)
	[1.62130]	[0.35327]	[-0.73988]
D(LNRIMP(-4))	0.204313	0.854566	0.116773
	(0.16079)	(0.89354)	(0.64029)
	[1.27069]	[0.95638]	[0.18238]
D(LNRIMP(-5))	0.049419	0.559223	0.160037
	(0.13478)	(0.74901)	(0.53672)
	[0.36666]	[0.74662]	[0.29817]

D(LNRIMP(-6))	0.045635	0.066292	0.080746
	(0.10358)	(0.57560)	(0.41246)
	[0.44059]	[0.11517]	[0.19577]
D(LNRIMP(-7))	0.024553	-0.227085	-0.125689
	(0.07100)	(0.39455)	(0.28273)
	[0.34582]	[-0.57555]	[-0.44455]
C	0.078851	-0.034283	-0.130794
	(0.02659)	(0.14775)	(0.10588)
	[2.96568]	[-0.23203]	[-1.23533]
R-squared	0.557338	0.467764	0.600256
Adj. R-squared	0.093598	-0.089818	0.181477
Sum sq. resids	0.079517	2.455707	1.260970
S.E. equation	0.061535	0.341963	0.245043
F-statistic	1.201832	0.838916	1.433349
Log likelihood	76.51811	1.053755	15.71749
Akaike AIC	-2.432641	0.997557	0.331023
Schwarz SC	-1.499997	1.930201	1.263668
Mean dependent	0.044621	-0.048649	-0.061341
S.D. dependent	0.064634	0.327568	0.270849

Determinant resid covariance (dof adj.)	5.89E-06
Determinant resid covariance	6.40E-07
Log likelihood	126.4637
Akaike information criterion	-2.475623
Schwarz criterion	0.443960